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PINE BEETLE HAZARD CONDITIONS  
 ON THE  
 WARM SPRINGS INDIAN RESERVATION  
 IN 1946

By

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 Portland 5, Oregon  
 January 30, 1948

SUBJECT—

INDEX NO.—

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INTRODUCTION

Prior to 1930 insect-caused losses in the ponderosa pine stands of the Warm Springs Indian Reservation were not of much concern. Since 1930 pine beetles, particularly the western pine beetle (Pandroctonus brevicomis Lec.), have been a constant plague in the commercially valuable stands throughout the Reservation. It was during the summer of 1930 that pine beetle populations, aided by the drastic drought conditions of the late 1920's, suddenly reached epidemic proportions in the fringe-type stands of the Reservation to begin a long series of abnormally high annual losses.

During the sixteen year period from 1931 to 1946 inclusive, the gross mortality of ponderosa pine from pine beetle attacks on the entire Reservation has been estimated to be 440 million board feet. In attempts to control or reduce this heavy drain, direct control projects were conducted regularly from 1933 to 1941 at a cost of slightly over \$250,000. Each project was successful in saving a large volume of timber that might otherwise have been destroyed. These and other similar direct control projects have demonstrated that pine beetle populations can be reduced to a certain low level beyond which further reductions are difficult to achieve. Because of this fact, the emphasis on pine beetle control during recent years has been placed on indirect measures through improved forest management practices.

In order to assist forest land managing agencies with their pine beetle problems, the personnel of the Portland Forest Insect Laboratory in 1944 started a series of pine beetle hazard surveys in specific areas. One of these areas was the Warm Springs Indian Reservation but it was not until the summer of 1946 that we were able to conduct the survey on the Reservation. During the period from August 29 to September 18, the writer, assisted by Mr. Richard Long of the Indian Service, completed the field work on this survey.

The primary purpose of this report is to summarize the hazard inventory data collected during the 1946 survey in the hope that it will emphasize the need for speeding up the selective cutting operations now in progress. This acceleration is warranted if the remaining virgin stands are to be utilized before insect depredations render them useless as "logging shows." While a complete hazard inventory includes several factors, the percentage of high risk trees present at a given time is one of the most important basic elements. This is the only factor that will be considered in the summary of hazard conditions on the Warm Springs Indian Reservation.

The writer wishes to thank Superintendent J. W. Elliott and Forest Supervisor N. Walter for the assistance and the courtesies extended during the survey. The help of Mr. Richard Long is also gratefully acknowledged. Without this cooperation, it would have been impossible to gather the data used in this report.

#### BASIS FOR PINE BEETLE HAZARD CONDITIONS

A determination of pine beetle hazard conditions in a given forest, for the purpose of predicting probable mortality within the next 10 to 15 year period, is the result of integrating both measurable and unmeasurable factors. The more important factors fall into two main groups. One group deals with the more or less permanent factors such as precipitation, temperature, elevation, soil conditions, etc. The second group concerns present stand conditions, whether the stand is composed of young, thrifty trees relatively unsusceptible to pine beetle attacks, or whether the stand is made up of mature and overmature trees in a stagnating and "high risk" condition.

This report deals with the measurable factor of the percentage of high risk trees found on the Warm Springs Indian Reservation as an indicator of mortality over a relatively short period. It considers neither the effect of varying site conditions nor the long range predictions of pine beetle losses. The rating of present stand conditions according to the degree of risk is of interest in determining which areas and units need primary consideration from a timber management standpoint.

#### DESCRIPTION OF THE AREA

The Warm Springs Indian Reservation was established by treaty on June 25, 1855. It comprises about 550,000 acres in Jefferson and Wasco Counties in north-central Oregon. Until recently, stock raising was the principal industry; however, selective logging operations, which started in the Schoolie Timber Sale Area in 1943, are now a most important and expanding industry.

The Reservation supports a stand of ponderosa pine and Douglas-fir valued at from seven to twelve million dollars. According to the statistics from the inventory phase of the resource survey, conducted by the United States Forest Service, the acreage of forest land and the volume of timber on the Reservation, as corrected in January 1945, were shown in Table 1.

Table 1. Acreage and Volume of Ponderosa Pine and Other Species on the Warm Springs Indian Reservation as of January 1, 1945

	<u>Jefferson</u> <u>County</u>	<u>Wasco</u> <u>County</u>	<u>Reservation</u> <u>Total</u>
Forest land (All species)	180,935 Acres	161,245 Acres	342,180 Acres
Volume of timber (All species)	1,355,000 MBM	1,670,000 MBM	3,025,000 MBM
Ponderosa pine acreage (12" DBH and up)	120,495 Acres	125,875 Acres	246,370 Acres
Ponderosa pine volume (12" DBH and up)	1,022,000 MBM	1,211,000 MBM	2,233,000 MBM

#### OBJECTIVES OF THE 1946 SURVEY

The objectives of the 1946 pine beetle hazard on the Warm Springs Indian Reservation were, in general, the same as those of other similar surveys:

- (1) To rate the ponderosa pine stands on the Reservation according to their risk or susceptibility to pine beetle attack.
- (2) To zone the stands according to their relative hazard to pine beetle damage during the next 10 to 15 years.
- (3) To further test the road-strip method of securing these data.

#### METHODS OF THE 1946 SURVEY

The methods used in determining the pine beetle hazard conditions on the Warm Springs Indian Reservation were the same as those developed and used by the personnel of the Portland Forest Insect Laboratory in making similar surveys on the Umatilla and Ochoco National Forests during the summers of 1944 and 1945. These methods will be briefly described in the following sections.

### Method of Cruising

Practically all of the survey data were collected by the road-strip method of cruising. To collect the necessary data, nearly every road passing through stands of ponderosa pine was utilized. In order to gather information on the Whitewater unit, two strips were cruised on foot.

Mr. Long drove the car (usually at speeds of from 5 to 7 miles per hour), recorded the cruising data and kept a log for each strip. Each strip was started at some convenient place - a road junction, a section line crossing, the reservation boundary, or the edge of the timber - and was run as a continuous strip on either side of the road until a natural break in the timber type occurred. A separate map was used to record the direction and number of all strips.

The writer acted as timber cruiser and rode on the right front fender of the car recording the data on tally registers held in a light wooden frame. By riding outside, the cruiser obtained an unobstructed view of all trees on the strip.

### Data Recorded

During the survey, the cruiser tallied all green ponderosa pine trees above 12 inches DBH (except trees in Keen Age Class 1) within a distance of one chain from the edge of the road or from the edge of the timber. Trees killed by insects in 1946 which were just starting to fade were considered as high risk trees. All trees were tallied by number of stems, since previous studies had shown that such a tally was accurate enough for the purpose and differed only slightly from a volume determination.

### Pine Beetle Risk Classes

Two broad classes of risk - "low risk" and "high risk" - were recognized during the survey. These classes were based on Keen's system of evaluating current tree health and risk to barkbeetle attack which penalizes trees for individual symptoms of unhealthy crowns, needle condition, and weakness or injury. All green ponderosa pines on the strip having a total penalty score of 0 - 4 points were considered to be "low risk trees", while all trees having a total penalty of 5 or more points were tallied as "high risk trees." These latter trees are the ones most likely to be attacked by pine beetles within a short time and should be removed from the stand as quickly as possible.

It should be pointed out that all trees rated as being of high risk may not be attacked in the near future and, conversely, some of the trees classed as low risk may be killed by pine beetles within the same period. The penalty system, therefore, serves as an excellent guide to the relative risk from pine beetle attack over a short period but is not a measure of actual mortality.

### Preparation of the Risk Map

The original risk map, a copy of which is enclosed in this report, was prepared in the field as the survey progressed. At the end of each half mile strip, the car was stopped and the number of trees and snags recorded on that half mile strip, together with notes on the general stand conditions. The percentage of high risk trees in that strip was computed and entered on a vellum overlay sheet over a 1/2 inch-to-the-mile type map. This percentage was expressed in one of the four colors shown in Table 2.

Table 2. Risk Class, Color, and Percentage of Risk Trees Used in the 1946 Survey.

<u>Risk Class</u>	<u>Color</u>	<u>Percentage of Risk Trees in the Stand</u>
1	Blue	0 - 7 %
2	Green	8 - 15 %
3	Yellow	16 - 21 %
4	Red	Over 21 %

In most cases a mile or more of strip could be run in the same risk class before coloring the map; however, the map was colored whenever a change in the risk classification occurred. Thus the map was built up as the work progressed in the field.

### ACCOMPLISHMENTS OF THE 1946 SURVEY

The accomplishments of the 1946 pine beetle hazard survey are summarized in Table 3.

Table 3. Accomplishments of the 1946 Survey

Number of days of field work	13 Days
Man-days of field work	26 Days
Miles of roadstrip cruised	142.5 Miles
Miles of ground strip cruised	12.5 Miles
Total miles of strip cruised	155.0 Miles
Miles of strip cruised per man-day	6.0 Miles
Acres cruised per mile of strip	8 Miles
Total acreage cruised	1,240 Acres
Acreage cruised per man-day	47.7 Acres
Percent of total acreage cruised	0.5 Percent
Number of green trees tallied	33,417 Trees

It is the opinion of the writer that the sampling of 1,240 acres or 0.5 percent of the 238,000 acres of virgin ponderosa pine on the Warm Springs Indian Reservation has provided a fair basis for rating the stands according to their risk from pine beetle attacks. The results of this survey, when applied to large blocks of timber, should give a fairly accurate picture of conditions on the Reservation. At the time of the survey there were approximately 8,000 acres of selectively cutover land in the Schoolie Sale area which were not covered by the survey.

#### RESULTS OF THE 1946 SURVEY

The map, accompanying this report, offers the best medium for depicting the results of the 1946 pine beetle hazard survey on the Warm Springs Indian Reservation. The total acreage of ponderosa pine in each of the four broad risk classes was computed by counting the number of 40-acre squares in each section. This acreage was further segregated by the six natural infestation units previously set up for the regional pine beetle survey project. The results of these computations are given in Table 4.

Table 4. Pine Beetle Hazard Conditions on the Warm Springs Indian Reservation in 1946.

Infestation Unit	Low Risk		Moderate Risk		High Risk		Very High Risk		Total	
	0 - 7%		8 - 15%		15 - 21%		Over 21%			
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Mutton Mt.	0	0	3,320	33.0	6,680	67.0	0	0	10,000	100
Sinnasho	0	0	4,600	17.0	8,000	30.0	14,400	53.0	27,000	100
He He	5,200	8.0	21,400	33.0	19,800	30.0	19,600	29.0	66,000	100
Boulder	1,000	2.0	13,400	28.0	19,200	40.0	14,400	30.0	48,000	100
Tanino	240	0.4	15,400	25.6	28,120	47.0	16,240	27.0	60,000	100
Whitewater	1,000	3.0	8,000	30.0	9,200	34.0	8,800	33.0	27,000	100
Total	7,440	3.0	66,120	28.0	91,000	38.0	73,440	31.0	238,000	100
Cutover									8,000	
Total Acreage									246,000	

Considering the general character of the ponderosa pine stands and the behavior of pine beetles on the Reservation, it was not surprising to find that over two-thirds (69%) of the total acreage carried stands of high and very high risk timber. Only 31 percent of the pine acreage supported stands of timber classed as low or moderate risk. From a timber manager's standpoint, the portions of the Reservation now containing a high percentage of high risk trees, as shown in red on the map, need prompt attention if excessive losses in the near future are to be avoided.

### Pine Beetle Hazard Conditions by Units.

In the following sections, the pine beetle hazard conditions on the Warm Springs Indian Reservation are discussed by infestation units from highest to lowest risk according to the percentages of "very high risk" trees shown in Table 4.

1. Simmasho Unit: (53% Very High Risk, 30% High Risk, 17% Moderate Risk). In spite of the fact that past pine beetle losses in this unit have been very heavy and have resulted in severe depletion in the virgin stands, the Simmasho Unit was found to contain more trees in a very high risk condition than any other unit. The trees on 53 percent of the unit acreage were classed as being of very high risk. On one half-mile road strip in this unit, 40.5 percent of the trees were tallied as high risk trees.
2. Whitewater Unit: (33% Very High Risk, 34% High Risk, 30% Moderate Risk, 3% Low Risk). Two separate blocks of timber in this unit were found to be in a very high risk condition. One block includes the drainages of Sheep, Walker, Mariel, and Jefferson Creeks. The second block is in the Rainy and Racing Creek drainages. This unit was advertised and a timber sale was made to the Tite Knot Lumber Company. Selective logging operations have already started on the southern portion of the unit, thus reducing the threat of excessive future pine beetle losses.
3. Boulder Unit: (30% Very High Risk, 40% High Risk, 28% Moderate Risk, 2% Low Risk). As shown on the map, the stands of high risk timber in the Boulder Unit are chiefly in a belt about two sections wide extending from Shitike Creek to Sawmill Butte. Two smaller blocks of timber, one between the South Fork of Boulder Creek and Middle Creek and the other near Miller Flat were also classed as very high risk. The survey also revealed a small patch of similar timber north and west of Peters Pasture Ranger Station.
4. He He Unit: (29% Very High Risk, 30% High Risk, 33% Moderate Risk, 8% Low Risk). The survey located one large block of very high risk timber in the He He Unit. This block includes the timber in the drainage of Badger Creek and Warm Springs River. In 1946, losses caused by the western pine beetle reached high epidemic proportions in the stands north of Sidwalter Butte and north and west of He He Butte. It was felt that direct control operations would be necessary in 1947 in most of this unit; however, the infestation broke with the winter broods of 1946 and control was not warranted. As a result of this epidemic, there are a great many recently killed salvagable trees which will be a total loss from a lumber standpoint unless salvage operations can be started at once. Logging operations began in the stands north of Old Mill Creek in 1943 and have been extended northward. Sanitation-salvage operations in advance of the main logging operations in this unit would salvage much valuable timber which will otherwise be lost in a few years.

5. Tenino Unit: (27% Very High Risk, 47% High Risk, 25.6% Moderate Risk, 0.4% Low risk). One large "C" shaped block of very high risk timber was located during the survey in the Tenino Unit. This block was in the upper Seekseequa Creek drainage and centered around Twin Buttes, Middle Butte and Shitike Butte. As evidenced by the annual cruises on the Twin Buttes check plot, western pine beetles are destroying a large number of large-diametered, high quality ponderosa pine each year. During the six year period from 1941 to 1946 inclusive, pine beetle losses on this plot have averaged nearly 160 board foot per acre per year and slightly over 1000 board foot per tree. A sanitation-salvage operation is urgently needed in this unit in order to utilize existing high values.

6. Mutton Mountain Unit: (67% High Risk, 33% Moderate Risk). The Mutton Mountain Unit is a distinct problem because of its isolated position and the fact that pine beetle depredations and repeated forest fires have greatly lowered timber sale values. It would be desirable if a utilization cut could be made in this unit in the near future.

#### RECOMMENDATIONS

From an entomological standpoint, the fact that the 1946 hazard survey found 69 percent of the total ponderosa pine acreage on the Warm Springs Indian Reservation supporting stands of "high" and "very high" risk timber, makes one conclusion and one recommendation self-evident. The institution of a series of rapid sanitation-salvage logging operations over most of the Reservation, ahead of the present program of selective cutting, appears to be the only method of utilizing existing high values in these mature and overmature stands and reducing the threat of excessive beetle losses in the near future. It is recognized that there are other factors (tribal regulations, allowable annual cuts, logging costs, etc.) that must be considered; however, certain it is that, unless salvage operations are greatly increased in the near future, pine beetles will continue to destroy a very large volume of high-quality, high-value timber.

The 1946 hazard survey served to emphasize the already-known fact that certain units contained more timber susceptible to pine beetle attack than others. In the preceding paragraphs, the six units on the Reservation were discussed according to the percentage of "very high" risk timber found during the survey from highest to lowest risk. In the following recommendations the writer offers suggestions for the reduction of pine beetle hazard conditions on the six units according to their priority from a timber management standpoint.

Before proceeding with any recommendations, a word of caution on the use of these data is in order. Both the risk class percentages and the boundaries of the stands in each risk class, shown on the map, must be considered solely as approximations. They are based upon extensive data and are far from exact. They are offered as a guide or as a pointer to draw attention to the fact that, on a comparative basis, the pine beetle hazard conditions in some stands of timber are more critical than in others. If remedial measures are contemplated, a much more detailed analysis of the stand structure in each unit must be made. The percentage of the stand volume to be removed in each unit must be obtained from regular stand structure cruises. It should not be obtained from the data herein reported.

1. The He He Unit should be given first consideration. Selective logging operations, now in progress on the southern portion of the unit, should be extended as rapidly as possible to the northern portion of the unit. In view of the excessive volume of recent insect-killed trees, resulting from the epidemic outbreak of the western pine beetle in 1946, and the high percentage of "very high" risk timber found on the northern portion of the unit, it is strongly recommended that sanitation salvage operations, designed to salvage these high values, be started immediately and conducted concurrently with present selective cutting operations in this unit.

2. Because of its juxtaposition to "going" logging operations, both on and off the Reservation, and the fact that 83 percent of the timber in the Simnasho Unit was classed as "high" and "very high" risk, immediate steps should be taken to salvage existing high values in the western portion of this unit. It is recognized that the Beaver Creek canyon presents a problem in hauling logs to the existing mill; however, it might be possible to move logs to mills outside the northern boundary of the Reservation over the Bear Springs or other roads.

3. Prompt action should be taken on the Tenino Unit, in and around Twin and Middle Buttes, to halt the wasteful destruction by the western pine beetle of trees which, during the past six years, have averaged over 1000 board feet per tree and nearly 160 board feet per acre. A sanitation-salvage operation is badly needed in this unit.

4. The high risk timber in the Boulder Unit should be salvaged at the earliest possible date. In the fringe-type stands bordering Miller Flat western pine beetle losses during recent years have averaged around 200 trees per section. While the number of killed trees has been high the board feet per tree has been low. A utilization cut in these poor site V stands would be desirable, while on the better sites a sanitation-salvage operation should be started as soon as possible.

5. The treatment of the Lutton Mountain Unit remains a problem. At present, pine beetle hazard conditions on the unit do not appear acute; however, the salvage of existing values through a utilization cut would be highly desirable.

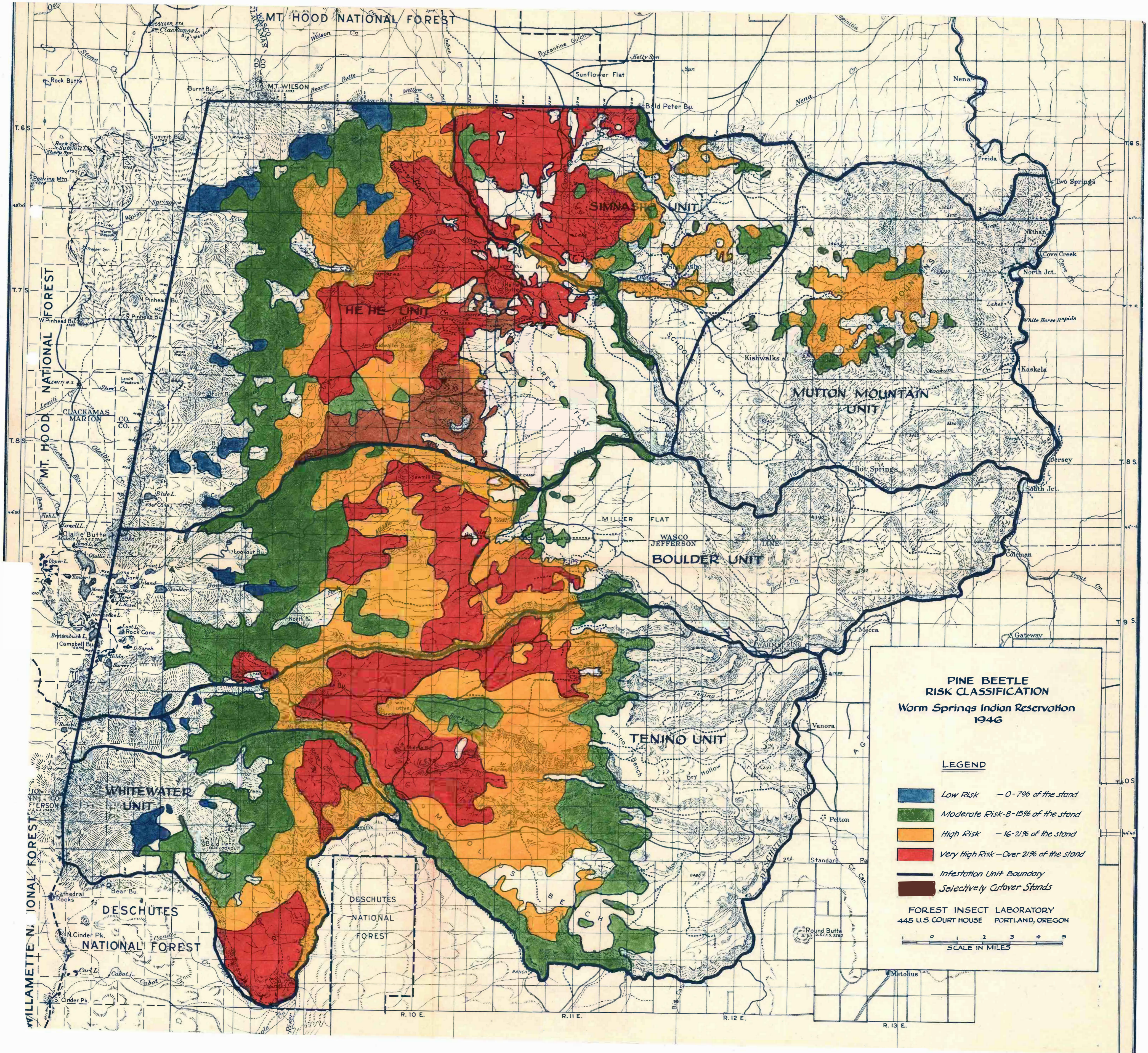
6. Pine beetle hazard conditions on the Whitewater Unit will be almost negligible when the present timber sale in the unit has been completed. No further recommendations are needed.

7. Finally, it is recommended that, in order to cope with this situation, the present allowable annual cut for the Warm Springs Indian Reservation be temporarily expanded to allow for several urgently needed sanitation-salvage operations so that present existing high values in mature and overmature stands can be utilized before they are wasted through pine beetle activities.

### CONCLUSIONS

Although the 1946 hazard survey covered only 0.5 percent of the total acreage of ponderosa pine on the Warm Springs Indian Reservation, it is felt that a fair basis for indicating current pine beetle hazard conditions was provided. The risk from attacks by the western pine beetle in practically all units of the Reservation is acute. As shown by the survey, 69 percent of the total acreage was classed as "high" and "very high" risk. Unless prompt steps are taken to salvage existing values in mature and overmature timber, pine beetles can be expected to continue extracting a heavy toll from the stands in practically all portions of the Reservation. The timber sales now in progress are steps in the right direction; however, it is felt that this process must be stepped up considerably if the wasteful depletion now occurring is to be checked.

It is hoped that the data herein presented will be of some help in planning an action program of sanitation-salvage operations in these important and valuable stands.



**PINE BEETLE  
RISK CLASSIFICATION  
Warm Springs Indian Reservation  
1946**

**LEGEND**

- Low Risk — 0-7% of the stand
- Moderate Risk — 8-15% of the stand
- High Risk — 16-21% of the stand
- Very High Risk — Over 21% of the stand
- Infestation Unit Boundary
- Selectively Cutover Stands

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